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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: : G. Winter
M. BRAMBILLA et al :
Serial No.: 09/937,973 : Group: 1746
Filed: October 1, 2001 :
For: FUEL CELL...LIQUID WATER :

475 Park Avenue South
New York, N.Y. 10016
June 17, 2004

RESPONSE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Responsive to the office action of March 24, 2004, Applicants request
reconsideration of the application in view of the remarks presented herein.

The claims in the application are claims 1 to 20, no other claims having been
presented.

Claims 1 to 14 were rejected under 35 USC 102 as being anticipated by the
Ramunni et al patent and claims 15 to 20 have been rejected under 35 USC 103 as being
obvious thereover taken in view of the Cisar et al patent. The Examiner states that the
Ramunni et al patent discloses polymeric membrane fuel cells fed with gaseous reactions
wherein a membrane (6) separates an anodic cathode from a cathodic compartment
comprising bipolar plates (1), gaskets (4), porous electrodes catalytic layers interposed

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between the membranes and the electrodes and further teaches manifolds for feeding the flow of reactants, manifolds for the discharge of unconverted portions of the reactants of the inerts and of the produced water and at least an injection point connecting a hydraulic circuit for injecting a water flow inside at least one compartment of the cells. The Examiner states that the gas injection could also be used to inject water and water flow provided contemporaneously for the humidification of the membranes and the removal of generated heat. The Cisar et al patent is cited to show that the reticulated element includes a depression for water distribution which passages 124 are deemed to provide the explicit motivation for making the claimed combination since Cisar et al states in column 11 that such a modification aids in hydrating the membrane without requiring the reliance on adding water to the reactant streams.

Applicants respectfully traverse these grounds of rejection since the Ramunni et al patent, whether taken alone or in view of the Cisar et al patent, would not suggest Applicants' invention to one skilled in the art. The Ramunni et al patent, which is Assignee's own patent, is the starting point for the present invention wherein fuel cells are fed with pre-humidified hydrogen gas and pre-humidified air or oxygen to a fuel cell and this is discussed on page 6 of the application as filed. Unfortunately, the pre-humidified hydrogen and air are unable to provide Applicants' solution to the problem since there is no water in the pre-humidified gases to evaporate and cause cooling of the cell.


In Applicants' cell, the problem of removing the locally generated heat and the problem of keeping the membrane hydrated are addressed at the same time by feeding a stream of water in the liquid state within at least one cell compartment and partially evaporating the same therein. In this fashion, the evaporated fraction of water cools down the cell by withdrawing the corresponding latent heat of evaporation (evaporative cooling) and the non-evaporated fraction of water is used to hydrate the membrane. Non-humidified reactants and liquid water are hence fed to the relevant cell compartments, whereby the membrane is hydrated directly by a mixed steam/liquid phase and not by the water content of pre-humidified reactants. A net evaporation of water occurs and this is beneficial for the overall thermal balance.

In the reference, a direct injection of liquid water is not mentioned and the reason for this is found in the discussion in Example 1 wherein there is hydrated reactant fed to the cell and the cell has no means for injecting liquid water and is fed with pure hydrogen and synthetic air, both pre-humidified at 80°C, (that is humidified outside the cell) while the average cell temperature is only 70°C. Since pre-humidification is effected at 80°C and the pre-humidified gases are fed to a cell at a lower temperature level, more evaporation takes place inside the cell and conversely, some water condensation will occur.

The water condensation effectively addresses the need of hydrating the membrane but not at all, the heat withdrawal requirement. On the contrary, the fact that the cell temperature is kept at 70°C while current (and therefore, heat) is generated in the cell and while warmer gases with condensing water are fed thereto is a clear indication that an external means is employed for cooling down the cell. In other words, the reference is completely silent as providing means for feeding liquid water inside the cell and teaches away from the present invention in that the process conditions indicated for operating the cell provide partial water condensation which is the opposite process to Applicants' partial water evaporation. Therefore, the reference neither anticipates nor renders obvious Applicants' invention and withdrawal of this ground of rejection is requested.

In view of the above remarks, it is believed that the claims clearly point out Applicants' invention and favorable reconsideration of the application is requested.

Respectfully submitted,
Muserlian, Lucas and Mercanti



Charles A. Muserlian, 19,683
Attorney for Applicants
Tel.# (212) 661-8000

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Enclosures